

**Journal of Endodontics, 1996, Vol. 22**

**NOVEMBER**

**Col. Schindler, Chairman Of Endodontics  
59th MDW Dental Directorate  
Lackland AFB, TX**

## **Articles:**

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**NOVEMBER (Cont.)**

**Col. Schindler, Chairman Of Endodontics  
59th MDW Dental Directorate  
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## **Articles:**

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- **An in vivo evaluation of Root ZX electronic apex locator**
- **Accidental Swallowing of a Dental Clamp**
- **Using rectified turpentine oil in endodontic retreatment**

## **Longitudinal sealing ability of mineral trioxide aggregate as a root-end filling material**

*Bates CF, Carnes DL, del Rio CE. Longitudinal sealing ability of mineral trioxide aggregate as a root-end filling material. J Endodon 1996;22:575-8.*

**PURPOSE:** To examine the longitudinal sealing ability of MTA, in comparison with amalgam with cavity liner and Super EBA, using the fluid filtration method.

**M&M:** Seventy-six single-rooted, extracted human teeth were cleaned and shaped using a step-back technique. After root-end resection and ultrasonic preparation, 72 root sections were randomly allocated to three groups of 24 teeth each and filled with dental amalgam (Tytin) and cavity liner, Super -EBA, or MTA. Microleakage was assessed at 24 h, 72 h, 2 wk, 4 wk, 8 wk, and 12 wk, using a fluid filtration measurement system.

**RESULTS:** MTA demonstrated the least amount of microleakage among the tested materials in 4 of 6 experimental periods, including the 8 and 12 week observations. The amalgam samples demonstrated the greatest amount of microleakage, as well as the greatest variability of individual readings at all experimental time periods. Maximum amalgam leakage was evident at 24 h. Microleakage was similar in the MTA and Super EBA groups throughout the entire experiment. Microleakage in the MTA group, as well as the Super-EBA group, was significantly less than in amalgam with cavity liner group at 24 h, 72 h, and 2 wk. At the subsequent 4-, 8-, and 12-wk experimental periods, there were no statistically significant differences among the amalgam with cavity liner, Super-EBA, and MTA groups.

**C&C:** The “tone” of the article focused on MTA’s minimal leakage. However, Super EBA was equally as good as MTA, both of which were better than amalgam. Other properties, such as handling characteristics, long term healing, inflammatory responses, etc. need to be determined so that practitioners can make informed decisions as to the most appropriate material to use in clinical situations.

**November 1996**

**Orest M. Harkacz, Sr.**

## **Microleakage of Human Saliva through Dentinal Tubules Exposed at the cervical Level in Teeth Treated Endodontically**

*Berutti E. Microleakage of Human Saliva through Dentinal Tubules Exposed at the cervical Level in Teeth Treated Endodontically. J Endodon 1996;22:579-82.*

**Purpose:** To investigate the probability of recontamination by saliva occurring via denuded dentin tubules denuded of cementum.

**M&M:** Thirty-four extracted anterior teeth were instrumented and obturated to within 2 mm of the coronal end. Cavit was placed in the remaining portion. A 3 mm ring, 2 mm below the coronal rim was denuded of cementum with scalers and treated with citric acid for 30 s. The specimens were immersed in whole human saliva from 20, 40 or 80 days with only the denuded ring exposed, then placed in Pelikan ink for 48 h. After clearing, the teeth were examined for extent of leakage.

**Results:** All specimens exposed to saliva showed some dye leakage. The amount of dye penetration increased down the canal as a function of exposure to saliva time. After extending down the canal, the dye extended into tubules from the canal.

**C&C:** The negative controls acted as expected, since they were totally encased in nail polish and sticky wax. Another set of controls, with no preparation or obturation, but with the cervical ring denuded and exposed to saliva would have made this study more meaningful. Why does saliva exposure time increase the leakage apparent with Pelikan ink? There was no use of chelating agents in the canal, so the smear layer is conceivably intact in the canal.

**November 1996**

**Robin E. Hinrichs**

## Effect of immediate and delayed post preparation on apical dye leakage using two different sealers

*Karapanou V, Vera J, Cabrera P, White RR, Goldman M. Effect of immediate and delayed post preparation on apical dye leakage using two different sealers. J Endodon 1996;22:583-5.*

**PURPOSE:** To compare the effect on the integrity of the apical seal of immediate and delayed post preparation using two commonly used sealers with different properties.

**M&M:** Eighty extracted teeth were endodontically prepared and divided into 4 groups. Group 1: The canals were filled with gutta-percha using lateral condensation and Roth 801 sealer. A post space was immediately prepared with Gates Glidden burs to a size 4 (leaving 5 mm of remaining filling). Group 2: The canals were filled as in group 1, but the sealer was allowed to set for 1 wk prior to post preparation. Group 3: Same procedure as in group 1, but AH-26 was the sealer. Group 4: Same procedure as in group 2, but the sealer was AH-26. The teeth were immersed in a 2% methylene blue solution under vacuum, washed, and longitudinally split. The extent of dye penetration was evaluated.

**RESULTS:** The only significant difference was in the delayed preparation group with zinc oxide-eugenol sealer, which showed greater leakage than the other groups.

**C&C:** The authors felt that the results in the delayed preparation group occurred because of the differing properties of the two materials. ZOE is a material with a weak chemical bond and a low tensile strength, whereas AH26 is a strong resin-based material with good adhesion to the dentin and much greater tensile strength, thus allowing it to resist crumbling caused by the rotary action of the burs used to prepared the canal. No mention was made whether the gutta-percha was vertically condensed after post preparation or not.

November 1996

Orest M. Harkacz, Sr.

## Evaluation of Temporary Restorations' Microleakage by Means of Electrochemical Impedance Measurements

*Jacquot BM, Panighi MM, Steinmetz P, G'sell C. Evaluation of Temporary Restorations' Microleakage by Means of Electrochemical Impedance Measurements. J Endodon 1996;22:586-89*

**Purpose:** To quantify the changes in watertightness of three temporary filling materials with an impedance measurement technique.

**M&M:** Forty sound extracted teeth were prepared. Access was made via the furcation for a working electrode to be placed. All soft tissue was removed, and 4-5 mm of Cavit, IRM or Fermit-N was placed. Impedance was measured from a working electrode placed apical to the temporary to electrodes placed in a NaCl solution. The tooth was suspended crown down into this solution.

**Results:** At time zero, all materials were "watertight". Cavit strongly decreased at day one through day 4. Fermit-N was similar, but did not lose as much watertightness. IRM decreased also, but less than the others and was stabilized at 2 days. After 1 w, stabilization of all materials was established.

**C&C:** The authors were attempting to develop a quantifiable way of measuring leakage via temporaries. However, due to the "inhomogeneity of variance and data being nonnormally distributed" nonparametric statistical tests were used. These tests are designed for non-quantifiable data! They should have increased their sample size at the very least.

**November 1996**

**Robin E. Hinrichs**

## Diffusion of calcium through dentin

*Gomes IC, Chevitaresh O, de Almeida NS, Salles MR, Gomes GC. Diffusion of calcium through dentin. J Endodon 1996;22:590-5.*

**PURPOSE:** To investigate whether calcium ions from a paste of calcium hydroxide and saline introduced into root canals diffuse through the dentin to reach the surface of the root.

**M&M:** Six teeth were opened and submitted to a biomechanical process, after which all the smear layer was removed. The experiment was divided into three phases: *Dissolution*: Each tooth, with no calcium hydroxide paste in place, was sealed cervically and apically and stored in deionized water until calcium losses from the tooth into the water were stabilized. *Dissolution and Diffusion I*: Each root canal was filled with a paste of calcium hydroxide and saline, sealed again apically and cervically, and returned to the solution used previously. Measurements for  $\text{Ca}^{2+}$  concentration were obtained. *Dissolution and Diffusion II*: Samples were divided into 3 parts: the control group or group 1, containing the original paste; group 2, in which the existing paste was diluted and the teeth were resealed and replaced in their solutions; and group 3, in which the existing paste was removed and a fresh paste was introduced. Measurements for  $\text{Ca}^{2+}$  concentration were obtained.

**RESULTS:** The diffusion was greater in group 3, followed by group 2. The diffusion of calcium from the control group (group 1) was statistically null. Calcium diffusion was observed in the first 16 days in all situations in which there was calcium hydroxide inside the root canals. Groups whose canals were packed with  $\text{Ca}(\text{OH})_2$  showed an increase in the levels of  $\text{Ca}^{2+}$  4.5 times higher, on average, than groups in which only dissolution ( $\text{Ca}^{2+}$  losses from the dentin) took place. Repacking the calcium hydroxide greatly enhanced the release of  $\text{Ca}^{2+}$  into the environment.

**C&C:** The concentrations of calcium peaked 2 to 3 wks after packing the canals with calcium hydroxide. However, this occurred in an in vitro situation, which favors saturation of the aqueous medium in which they were stored, a situation not encountered in vivo. Also, the teeth were temporized by Cavit, which may have contributed a potential source of  $\text{Ca}^{2+}$ . The authors concluded the following: the tooth tends to lose  $\text{Ca}^{2+}$  into the aqueous medium when immersed therein;  $\text{Ca}^{2+}$  coming from the  $\text{Ca}(\text{OH})_2$  contained in the root canal diffuses through the dentin into the external medium; fresh filling with  $\text{Ca}(\text{OH})_2$  paste causes appreciably more diffusion than the addition of saline solution to the paste already found in the canals; and diffusion of  $\text{Ca}^{2+}$  tends to stabilize ~16 days after packing the canals with  $\text{Ca}(\text{OH})_2$  paste and saline solution.

November 1996

Orest M. Harkacz, Sr.

## **Effect of Power Settings on Temperature Change at the Root Surface when Using a Holmium YAG Laser in Enlarging the Root Canal**

*Cohen BI, Deutsch AS, Musikant BL. Effect of Power Settings on Temperature Change at the Root Surface when Using a Holmium YAG Laser in Enlarging the Root Canal. J Endodon 1996;22:596-9.*

**Purpose:** To determine the maximum power, in watts, that a Holmium YAG laser could deliver without raising cementum temperatures more than 5 C.

**M&M:** Sixty teeth, divided into three groups were mechanically prepared to a size 25, then lased at 0.5, 0.75, or 1.0 W. The active cutting laser was directed to the lateral walls of the canal, and not the apical area using a 0.245 µm optical fiber. Temperature measurements were recorded with thermocouplers applied coronally and apically. The largest file that could be placed to length was then determined.

**Results:** There were no differences in the amount of apical or coronal temperature changes or file size in any of the three groups. All temperature changes were below the 5C threshold, indicating a safe and predictable laser procedure.

**C&C:** The study seems impressive, though it does not fulfill the stated purpose. The results were somewhat uneven, as at least one specimen at 0.75 W had a <10<sup>0</sup> C change. Although not stated, this seems to be a proprietary study, as it was underwritten by Essential Dental Laboratories, and the authors are employees of this outfit.

**November 1996**

**Robin E. Hinrichs**

## **Immunohistochemical demonstration of prostaglandins E<sub>2</sub>, F<sub>2α</sub>, and 6-keto-prostaglandin F<sub>1α</sub> in rat dental pulp with experimentally induced inflammation**

*Miyauchi M, Takata T, Ito H, Ogawa I, Kobayashi J, Nikai H, Ijuhin N. Immunohistochemical demonstration of prostaglandins E<sub>2</sub>, F<sub>2α</sub>, and 6-keto-prostaglandin F<sub>1α</sub> in rat dental pulp with experimentally induced inflammation. J Endodon 1996;22:600-2.*

**PURPOSE:** To examine the immunohistochemical localization of PGs in experimentally induced pulpitis of rats by opening the pulp chamber.

**M&M:** Using formalin-fixed and EDTA-decalcified cryostat sections, the immunohistochemical localization of prostaglandin E<sub>2</sub>, PGF<sub>2α</sub>, and 6-keto-PGF<sub>1α</sub> was examined in normal and inflamed rat dental pulps. Inflammation was induced in the right and left first molars of rats by opening the pulp chambers with a #1/2 round bur. The molars were left open to the oral environment for 3 and 5 days, and for 1 to 3 wk.

**RESULTS:** Opening the pulp chamber evoked suppurative inflammation in pulp. There was no immunoreactivity for prostaglandins in normal dental pulp, whereas positivities for PGE<sub>2</sub>, PGF<sub>2α</sub>, and 6-keto-PGF<sub>1α</sub> were demonstrated in the cytoplasm of macrophages and endothelial cells in the inflamed dental pulp. In addition to these cells, numerous pulp cells and odontoblasts existing in the inflamed dental pulp and its apical noninflamed area also were intensely stained for PGF<sub>2α</sub>. The area containing the PG-positive cells gradually shifted to more apical sites, with the progression of pulp inflammation toward the root apex.

**C&C:** In addition to endothelial cells and macrophages, numerous odontoblasts and pulp cells located in the inflamed pulp were intensely stained for PGF<sub>2α</sub>. Furthermore, these PGF<sub>2α</sub>-positive odontoblasts and pulp cells were distributed not only in the inflamed area, but also in its apical noninflamed area. It is generally recognized that PGF<sub>2α</sub> causes several opposing effects to those of PGE<sub>2</sub> and PGI<sub>2</sub>. For example PGE<sub>2</sub> and PGI<sub>2</sub> increase vascular permeability, whereas PGF<sub>2α</sub> has an inhibitory effect on the increase of vascular permeability. PGE<sub>2</sub> and PGI<sub>2</sub> promote osteoclastic bone resorption, whereas PGF<sub>2α</sub> does not cause any significant increase of bone resorption. Therefore PGF<sub>2α</sub> may be produced by pulp cells and odontoblasts located in the apical noninflamed dental pulp surrounding the inflammatory lesion to modulate the tissue response to the increase in PGE<sub>2</sub> and PGI<sub>2</sub> synthesis in the inflamed area, and to counteract the actions of PGE<sub>2</sub> and PGI<sub>2</sub> as inflammatory mediators.

**November 1996**

**Orest M. Harkacz, Sr.**

## **Analysis of Nickel-Titanium Versus Stainless Steel Instrumentation by Means of Direct Digital Imaging**

*Coleman CL, Svec TA, Rieger MR, Suchina JA, Wang MM, Glickman GN. Analysis of Nickel-Titanium Versus Stainless Steel Instrumentation by Means of Direct Digital Imaging. J Endodon 1996;22:603-7.*

**Purpose:** To compare instrumentation by Ni-Ti and SS K-files using step-back enlargement in curved canals with a Bramante technique using direct digital imaging.

**M&M:** The Bramante technique was used, with evaluation via direct digital image comparison and computer programming. Teeth were instrumented with SS precurved files, or Ni-Ti files. Custom reference grids were constructed to aid in analysis.

**Results:** There was no significance at the apical, middle or coronal sections between files concerning the amount of area removed. Ni-Ti files were more centered in the apical and coronal sections. There was no significant difference in the shape factor or time it took to instrument the canals.

**C&C:** The authors state that their results are different from Glosson, et al. who stated that the Ni-Ti files did not improve centering ability. Although the same files were used in this study, the motion was not the same. These authors do not state their file motion, but I infer that a filing one was used as they were precurving their SS files. We don't know that the same motion was used for both files in this study. Glosson et al. used a quarter-turn, pull motion for both their groups. The pictures accompanying this article don't seem to belong.

**November 1996**

**Robin E. Hinrichs**

## **An assessment of the ability of various materials to seal furcation canals in molar teeth**

*Welch JD, Anderson RW, Pashley DH, Weller RN, Kimbrough F. An assessment of the ability of various materials to seal furcation canals in molar teeth. J Endodon 1996;22:608-11.*

**PURPOSE:** To determine the incidence of patent furcation canals in maxillary and mandibular molar teeth using the fluid filtration method. Various restorative materials used to seal the furcation canals in molar teeth were assessed.

**M&M:** Ninety-seven maxillary and mandibular molar teeth were evaluated for the presence of furcation canals using the fluid filtration method. Only one specimen demonstrated a naturally occurring patent furcation canal. An artificial furcation canal was created with a 0.33-mm drill bit in the 96 teeth lacking naturally occurring furcation canals. Fluid filtration measurements were made before and after the artificial canal was made, and these served as the negative and positive controls for each tooth. The 96 teeth were randomly divided into 8 equal groups, and the floor of the pulp chambers was sealed using 3 mm of either Tytin or Dispersalloy amalgams, Vitremer, FluoroCore, gutta-percha with sealer, Tytin with All-Bond 2 or Amalgambond, or Dispersalloy with All-Bond 2. Microleakage measurements were made on all the experimental groups at time intervals of 1 wk, 1 month, and 3 months after placement of the test material.

**RESULTS:** It was found that only 1 of 97 test specimens, or 1%, had a naturally occurring furcation canal using the fluid filtration method. Analysis of measured microleakage at 3 months indicated that Tytin amalgam used alone had significantly more microleakage than all other materials; however, this difference did not exist when bonding agents were used with Tytin. All materials leaked significantly less than the positive controls.

**C&C:** These results pertain to restorative materials placed on dentin not contaminated with sealer. A more clinically relevant study would have been to evaluate the sealing ability of the materials after placement on dentin contaminated with various endodontic sealers (ZOE type, AH-26, Ca(OH)<sub>2</sub> containing, etc.), and to determine if the sealer itself may be adequate enough to seal the furcation canals without the need for any additional restorative material.

**November 1996**

**Orest M. Harkacz, Sr.**

## **Development of a Quantitative Sampling Method for Periapical Exudates from Human Root Canals**

*Shimauchi H, Miki Y, Takayama S, Imai T, Okada H. Development of a Quantitative Sampling Method for Periapical Exudates from Human Root Canals. J Endodon 1996;22: 612-5.*

**Purpose:** To develop a quantitative sampling method for periapical exudates from root canals.

**M&M:** Absorbent paper points, size 40 were placed into root canals of teeth with apical periodontitis after establishment of WL. After 30 s, the point was removed and immediately measured. This was repeated until the pulp space was dry. Points were placed in a microfuge tube to collect a supernatant that was measured for IL-1 $\beta$  activity.

**Results:** 27 of the 29 samples had detectable IL-1 $\beta$  activity. There was no significant correlation between IL-1 $\beta$  concentration and exudate volume. These results strongly indicate the local production of IL-1 $\beta$  in the periapical lesion. The different levels may represent the bone resorption activity of that particular lesion.

**C&C:** I would be cautious about placing a size 40 paper point in a canal after establishing WL. I would be afraid that fluid might cause the point to expand to the point of making retrieval difficult.

**November 1996**

**Robin E. Hinrichs**

## **An in vivo evaluation of Root ZX electronic apex locator**

*Shabahang S, Goon WWY, Gluskin AH. An in vivo evaluation of Root ZX electronic apex locator. J Endodon 1996;22:616-8.*

**PURPOSE:** To determine the ability of the Root ZX to locate the apical foramen in unprepared root canals of vital teeth.

**M&M:** Seven patients with a total of 26 teeth treatment planned for extraction participated in the study. The apical foramen was located with the Root ZX device by advancing a fine endodontic file toward the apex. File insertion was stopped when the device indicated the foramen had been reached, and self-curing glass ionomer was injected into the access cavity to lock the file in place. After extraction, the teeth were cleared and a stereomicroscope was used to confirm visually the relationship of the tip of the file to the apical foramen.

**RESULTS:** In a moist canal environment, the Root ZX device located the apical foramen precisely in 17 roots (65.4%). The endodontic file protruded beyond the foramen in 8 roots (30.8%) and did not reach the foramen in one root (3.8%). The mean distance of the overextension was 0.269 mm. When a potential error of  $\pm 0.5$  mm from the foramen is accepted as a tolerable range for the clinical application of an electronic apex locator, the Root ZX was able to locate the foramen within this range in 25 teeth for a clinical accuracy of 96.2%.

**C&C:** For the file tip located exactly at the foramen, a withdrawal of 0.5 mm or more would position the instrument within the apical constriction. Nine (34.6%) of the samples would have required this type of adjustment. For the file tip located just beyond the foramen, a withdrawal of 1.0 mm or more may be necessary to avoid overpreparation and potential destruction of the constriction. Eight specimens (30.7%) would have required this degree of adjustment. Therefore, approximately two thirds of the measurements were past the minor diameter. Metallic restorations interfered with electrical conductivity of the unit. In heavily calcified canals, patency needed to be established before determining the electronic signal of the apical foramen.

**November 1996**

**Orest M. Harkacz, Sr.**

## **Accidental Swallowing of a Dental Clamp**

*Mejia JL, Donado JE, Posada A. Accidental Swallowing of a Dental Clamp. J Endodon 1996;22:619-20.*

**Summary:** An 11 YO patient swallowed a RD clamp before the dam could be applied. It passed without incident. No floss was on the clamp, but the authors now recommend doing so.

**November 1996**

**Robin E. Hinrichs**

## Using rectified turpentine oil in endodontic retreatment

*Kaplowitz GJ. Using rectified turpentine oil in endodontic retreatment. J Endodon 1996;22:621.*

**SUMMARY:** A clinical technique was described for delivering heated-rectified turpentine oil to the canal space to facilitate the softening and removal of gutta-percha. The turpentine oil should be heated to 160<sup>0</sup> F (71<sup>0</sup> C) to increase its reactivity before delivery to the canal space.

**C&C:** Normal room temperature rectified turpentine works well also. If you do intend to heat the material, do not do so over an open flame, as it is flammable.

**November 1996**

**Orest M. Harkacz, Sr.**